

**Comment on "Geoeffectiveness of halo coronal mass
ejections" by Gopalswamy, N., S. Yashiro, and S.
Akiyama"**

Yu. I. Yermolaev

Space Plasma Physics Department, Space Research Institute, Russian

Academy of Sciences, Profsoyuznaya 84/32, Moscow 117997, Russia

Yu. I. Yermolaev Space Plasma Physics Department, Space Research Institute, Russian
Academy of Sciences, Profsoyuznaya 84/32, Moscow 117997, Russia. (yermol@iki.rssi.ru)

⁶ **Abstract.** (No abstract for comment)

Gopalswamy et al. [2007] studied the geoeffectiveness of halo coronal mass ejections (CMEs) on the basis of solar observations during 1996-2005 and found that the geoeffectiveness of 229 frontside halo CMEs was 71%. Recently for observations of 305 frontside halo CMEs during 1997-2003 the geoeffectiveness was found to be 40% [*Kim et al.*, 2005]. Complex analysis of both solar and interplanetary measurements showed that the geoeffectiveness of frontside halo CMEs is likely to be about 50% [*Yermolaev et al.*, 2005; *Yermolaev and Yermolaev*, 2006]. *Gopalswamy et al.* [2007] did not discuss possible causes of this difference and were limited only to the general words: "The reason for the conflicting results (geoeffectiveness of CMEs ranging from 35% to more than 80%) may be attributed to the different definition of halo CMEs and geoeffectiveness". So, here we shall present our point of view on high geoeffectivenesses of CME obtained in paper by *Gopalswamy et al.* [2007].

Different statistics of frontside halo CMEs (305 events during 1997-2003 [*Kim et al.*, 2005] and 229 events during 1996-2005 [*Gopalswamy et al.*, 2007]) indicates that *Gopalswamy et al.* [2007] used harder criteria of event selection. They wrote: "The solar source of a halo CME is usually given as the heliographic coordinates of any associated eruption region obtained in one or more of the following ways: (1) using H-alpha flare location if available from the Solar Geophysical Data, (2) running EIT movies with superposed LASCO images to identify any associated disk activity such as EUV dimming, and (3) identifying the centroid of the post eruption arcades in X-ray and EUV images when available" and then "For backside halos we do not see any disk activity". On the other hand, attempts of association of interplanetary CMEs (ICMEs) with coronal CMEs showed that this approach is incorrect. *Zhang et al.* [2007] wrote in Introduction: "a number of ICMEs,

including those causing major geomagnetic storms, were found not to be associated with any identifiable frontside halo CMEs [Zhang *et al.*, 2003; Schwenn *et al.*, 2005]”. They studied sources of 88 large magnetic storms ($Dst < -100$ nT) during 1996-2005 and found that ”nine events clearly showed ICME signatures in the solar wind observations. However, we were not able to find any conventional frontside halo CME candidates in the plausible search window, i.e., we fail to identify any eruptive feature on the solar surface (e.g., filament eruption, dimming, loop arcade, or long-duration flare), in spite of the availability of disk observations from EIT, SXT, or SXI. Similar ”problem events” have been reported earlier [Webb *et al.*, 1998; Zhang *et al.*, 2003]”. We think that similar selection methods are used in papers by Gopalswamy *et al.* [2007] and Zhang *et al.* [2007], because several co-authors took part in both papers.

Thus, we can conclude:

1. Selection method used by Gopalswamy *et al.* [2007] is incorrect because it identifies part of frontside halo CMEs (fronside halo CMEs without disk activity) as backside halo CMEs;
2. List of frontside halo CMEs used by Gopalswamy *et al.* [2007] is incorrect because it does not include all frontside halo CMEs during indicated period;
3. Estimation of geoeffectiveness of frontside halo CMEs made by Gopalswamy *et al.* [2007] is incorrect because they found a geoeffectiveness only of frontside halo CMEs with disk activity.

Acknowledgments. Work was in part supported by RFBR, grant 07-02-00042.

References

- Gopalswamy, N., S. Yashiro, and S. Akiyama (2007), Geoeffectiveness of halo coronal mass ejections, *J. Geophys. Res.*, 112, A06112, doi:10.1029/2006JA012149
- Kim, R.-S., K.-S. Cho, Y.-J. Moon, Y.-H. Kim, Y. Yi, M. Dryer, S.-C. Bong, and Y.-D. Park (2005), Forecast evaluation of the coronal mass ejection (CME) geoeffectiveness using halo CMEs from 1997 to 2003, *J. Geophys. Res.*, 110, A11104, doi:10.1029/2005JA011218.
- Schwenn, R., A. Dal Lago, E. Huttunen, and W. D. Gonzalez (2005), The association of coronal mass ejections with their effects near the Earth, *Ann. Geophys.*, 23, 1033-1059.
- Webb, D. F., E.W. Cliver, N. Gopalswamy, H. S. Hudson, and O. C. St. Cyr (1998), The solar origin of the January 1997 coronal mass ejection, magnetic cloud and geomagnetic storm, *Geophys. Res. Lett.*, 25, 2469- 2472.
- Yermolaev Yu. I., M. Yu. Yermolaev, G. N. Zastenker, L.M.Zelenyi, A.A. Petrukovich, J.-A. Sauvaud (2005), Statistical studies of geomagnetic storm dependencies on solar and interplanetary events: a review, *Planetary and Space Science*, 53/1-3 pp. 189-196.
- Yermolaev Yu.I. and M.Yu. Yermolaev (2006), Statistic study on the geomagnetic storm effectiveness of solar and interplanetary events, *Adv.Space Res.*, 37, Issue 6, p. 1175-1181
- Zhang, J., K. P. Dere, R. A. Howard, and V. Bothmer (2003), Identification of solar sources of major geomagnetic storms between 1996 and 2000, *Astrophys. J.*, 582, 520-533.
- Zhang, J., et al. (2007), Solar and interplanetary sources of major geomagnetic storms ($Dst < -100$ nT) during 1996-2005, *J. Geophys. Res.*, 112, A10102,

⁷³ doi:10.1029/2007JA012321.